

A NEW GENUS OF HYDROBIID SNAILS
(MOLLUSCA: GASTROPODA: PROSOBRANCHIA: RISSOOIDEA)
FROM NORTHERN SOUTH AMERICA

Robert Hershler and France Velkovrh

Abstract.—An aquatic hydrobiid cavesnail from Andes Mountains of Colombia and Ecuador is described (*Andesipyrgus sketi*, new genus, new species). The genus is placed in the Cochliopinae based on females having a sperm tube separated from the glandular gonoduct. Diagnostic features of *Andesipyrgus* include a minute, near-pupiform shell with thickened aperture; unpigmented animal (except for eyespots); reduced ctenidium; female genitalia featuring complex histology of glandular gonoduct, oviduct coiled onto right side of albumen gland, and absence of seminal receptacle; and male with simple, slender penis. *Andesipyrgus* does not closely resemble other cochliopinids having a simple penis, and appears remotely related to other South American hydrobiid fauna.

The aquatic prosobranch snails of the family Hydrobiidae comprise a large cosmopolitan group of several hundred genera and a few thousands of Recent species. While the group is highly diverse at lower taxonomic levels in most of the major physiographic regions where it occurs, one of the few exceptions is South America, where only seven genera (and about 120 Recent species) are found. (North America has about 40 genera and over 200 species by comparison.) Of these, each of five are represented by less than 10 species on the continent, while the remaining two (*Heleobia* Stimpson, 1865; *Potamolithus* Pilsbry, 1896) have radiated extensively. The apparent paucity of hydrobiid fauna in South America surely relates in part to hydrographic/geologic and historical features of the continent, but also probably reflects inadequate sampling of the brackish coastal and inland waters of this huge land mass.

One habitat that has been especially neglected in the search for these animals in South America is cave streams, whose hydrobiid fauna often is diverse and strongly differentiated from local epigeal (surface-dwelling) taxa. While caves are not extreme-

ly numerous in the continent, there are large areas of karstic terrain to the north (especially in the Andes Mountains and in the Amazon basin of Brazil) which are potentially fertile areas for discovery of cavesnail fauna. A recent compendium of subterranean aquatic mollusks (Bole & Velkovrh 1986) listed only a single species of hydrobiid cavesnail from South America, which was collected from the Andes Mountains of Ecuador by a Yugoslavian expedition during 1978 (Sket 1985). Restudy of this material and other collections made by a Yugoslavian expedition to the Colombian Andes in 1984 (Sket 1988) confirmed the uniqueness of this animal, which we describe as a new genus and species below.

Material studied is from the personal collection of the second author (FV). Types have been deposited in the National Museum of Natural History, Smithsonian Institution (USNM).

Family Hydrobiidae Troschel, 1857
Subfamily Cochliopinae Tryon, 1866
Andesipyrgus, new genus

Type species.—*Andesipyrgus sketi*, new species.

Diagnosis.—Shell minute-small, smooth, narrow, with thickened aperture. Operculum corneous, thin, with eccentric nucleus and slightly thickened ventral attachment scar. Radula taenioglossate; central teeth with two pairs of basal cusps, marginal and lateral teeth with relatively numerous, fine cusps. Rectum with bend or loop in posterior pallial cavity. Stomach without posterior caecum. Animal unpigmented except for eyespots. Ctenidium reduced in length, and with relatively few filaments. Females oviparous; glandular gonoduct of complex histology. Oviduct coiled behind (onto right side) of albumen gland, bursa copulatrix of posterior position, seminal receptacle absent. Bursal duct opening to sperm tube, which has an anterior connection to the capsule gland. Male prostate gland with prominent pallial section. Penis slender, simple, without lobes or enlarged glands.

Remarks.—The pupiform shell with thickened aperture of *Andesipyrgus* (similar to that of unrelated *Bythinella* Moquin-Tandon, 1855, from Europe) does not resemble that of any other South American hydrobiid. A remote affinity with other fauna of the region is further suggested by the configuration of female genitalia (notably the coiled oviduct), which is unique in the Cochliopinae (and substantially different from the usual pattern of a single coil of oviduct on the left side of the albumen gland). The simple penis (without terminal constriction or large-sized glands) of *Andesipyrgus* is shared by 10 other cochliopinid genera, including several other subterranean forms. This is considered a phylogenetically diverse group (almost certainly representing a grade of organization), whose genera are of uncertain relationship both to one another (in most cases) and to other cochliopinid groups (Hershler & Thompson 1992). *Andesipyrgus* does not closely resemble any of these genera and further evaluation of its affinities cannot be made at this time.

Several morphological features of *Ande-*

sipyrgus, including pigmented eyespots and brown periostracum, suggest that this animal only recently invaded cave waters.

Etymology.—From Andes, referring to distribution along the Andes Mountains, and Classical Greek *pyrgos*, meaning tower and referring to the moderately elongate shell. Gender masculine.

Andesipyrgus sketi, new species

Figs. 1–5, Table 1

Littoridina(?) *jumandi* Bole & Velkovrh 1986:196. [Nomen nudem.]

“Hydrobioidea-Gastropoda.”—Sket 1985: 84.

“Hydrobioidea.”—Sket 1988:55, 58.

Material examined.—Colombia (Santander Department): La Paz area (6°11'N, 73°35'W)—Cueva de los Indios, ca. 6 km SW of La Paz, 1995 m elevation, VI-1984, FV 43575, FV 43689, USNM 860574 (holotype), USNM 860575 (paratypes); Hoyo (de) Colombia, ca. 6 km SSE of La Paz, 1775 m (1 broken shell), VI-1984, FV 43691; Hoyo del Aire, ca. 6 km SSW of La Paz, 1800 m, VI-1984, FV 43690. San Gil area (6°33'N, 73°08'W)—Cueva del Indio, ca. 7.5 km S of San Gil, 1270 m, VI-1984, FV 43685. Ecuador: Cavernas de Jumandi, near Archidona (0°55'S, 77°48'W), 140 km SW of Quito, Napo Province, about 500 m, XII-1978, FV 38129, FV 38130.

Description.—Shell (Figs. 1, 2a) narrowly conic to pupiform, 1.6–2.5 mm tall, with 4.0–4.5 whorls. Protoconch (Fig. 2b) blunt, smooth except for very faint pattern of low wrinkles. Teleoconch whorls near flat to slightly convex, rarely with slight adapical shoulders and/or weak adapical angulation; sutures very shallow. Teleoconch sculpture of moderately strong growth lines. Aperture ovate, less than 50% of shell height, broadly adnate or very slightly separated from body whorl, usually chalk-white (possibly due to lengthy preservation in alcohol). Inner lip complete, moderately reflected, thickened, sometimes markedly so in parietal region.

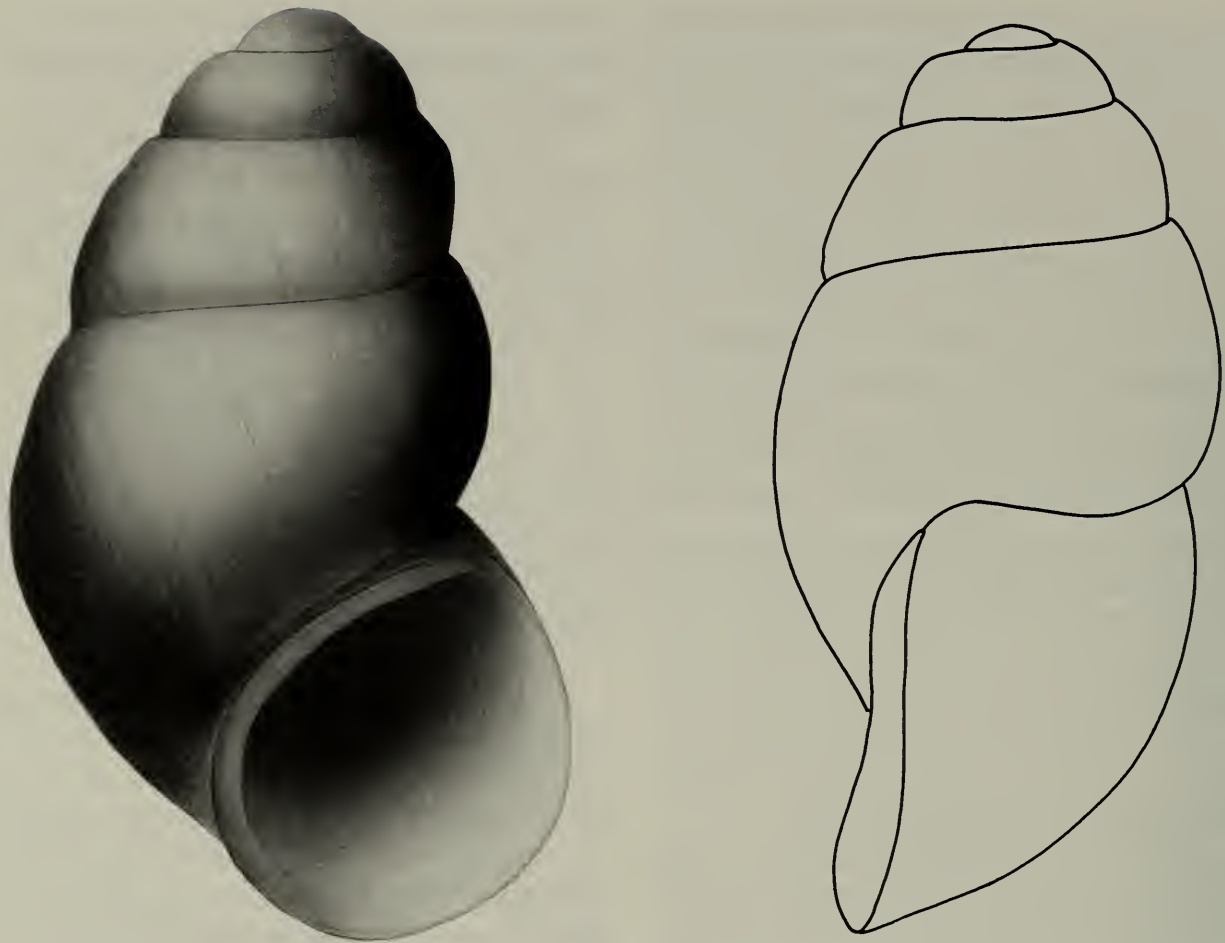


Fig. 1. *Andesipyrgus sketi*, holotype, USNM 860574, standard and side views. Shell height, 2.0 mm.

Outer lip thick, slightly expanded, weakly sinuate, near orthocline. Umbilicus absent or very narrowly rimate. Periostracum brown.

Measurements (mm) of the shells of the holotype and nine paratypes are in Table 1.

Operculum (Fig. 2c–e) light brown, transparent, ovate, paucispiral. Attachment scar with weakly developed central callus and slight thickening along inner margin.

Radular ribbon about 470 μm long and 70 μm wide, of about 66 rows of teeth,

Table 1.—Shell measurements (mm) for *Andesipyrgus sketi*. SH = standard height, HBW = height of body whorl, SW = standard width, AH = aperture height, AW = aperture width, WH = number of whorls.

	SH	HBW	SW	AH	AW	WH	SW/SH
Holotype	2.0	1.5	1.2	0.87	0.79	4.0	0.58
Paratypes	2.1	1.4	1.2	0.83	0.81	4.25	0.58
	2.2	1.5	1.2	0.91	0.87	4.5	0.55
	2.0	1.3	1.1	0.75	0.73	4.5	0.55
	2.2	1.5	1.2	0.81	0.73	4.5	0.54
	2.1	1.4	1.2	0.87	0.81	4.25	0.58
	2.2	1.5	1.3	0.89	0.85	4.5	0.58
	2.1	1.4	1.2	0.83	0.79	4.5	0.57
	2.2	1.5	1.2	0.85	0.89	4.25	0.54
	2.1	1.5	1.2	0.81	0.83	4.25	0.56
	2.0	1.4	1.2	0.85	0.75	4.0	0.61



Fig. 2. Scanning electron micrographs of shell and opercula of *A. sketi*, USNM 860575. a. Shell (height, 2.1 mm). b. shell apex (bar = 100 μm). c. Operculum, dorsal surface (bar = 176 μm). d, e. Operculum, ventral surface (bar = 200 μm).

scarcely extending beyond edge of well-developed buccal mass and without posterior coil. Central teeth (Fig. 3a, b) trapezoidal, with well indented dorsal edge; lateral angles narrow, slightly thickened, well expanded and sometimes broadened distally. Lateral cusps of central teeth narrow, 4–5; central cusp slightly longer than laterals; basal cusps moderate to long, arising from

face of tooth near origin of lateral angles, inner cusp much broader and slightly longer than outer. Basal process of central teeth narrow, well excavated. Lateral tooth (Fig. 3d) formula, 2(inner)/1/3–4(outer); cusps narrow, curved, with central cusp enlarged. Marginal teeth (Fig. 3c, d) with numerous (about 17–20) cusps. Rectum broadly overlapping glandular gonoducts, with bend (fe-



Fig. 3. Radula of *A. sketi*, USNM 860575. a. Central teeth (bar = 6 μm). b. Central teeth (bar = 10 μm). c. Outer marginal teeth (bar = 10 μm). d. Lateral and inner marginal teeth (bar = 13.6 μm).

males) or pronounced U-shaped loop (males) in posterior portion of pallial cavity; anus near mantle edge.

Animal white (except for black eyespots), without melanin pigment. Cephalic tenta-

cles with narrow central band of elongate cilia on dorsal surface.

Ctenidium filling about 66% of pallial cavity length, extending from well anterior to pericardium almost to mantle edge. Cte-

nidial filaments about 12, short and narrow. Osphradium narrowly ovate, about 33% of ctenidium length, positioned along posterior half of ctenidial axis. Kidney with slight bulge into pallial cavity; kidney opening thickened, white. Hypobranchial gland weakly developed.

Ovary a small unlobed mass filling about 0.25 whorls and slightly overlapping posterior stomach chamber. Albumen gland (Fig. 4a, Ag) with large pallial section (> 50% of length). Capsule gland (Cg) about equal to albumen gland in length, of two tissue sections (posterior, orange; anterior, white). Capsule gland composed of folded glandular cells, thick-walled, with central lumen. Coiled oviduct (Co) bends posteriorly behind pallial wall, loops behind albumen gland to right side, then twists back to left side of gland, where it coils once before looping to right side of bursal duct (Dbu) before joining the duct at the pallial wall. Coiled oviduct with thin muscular coat, strongly ciliated. Bursa copulatrix (Bu) small (about 33% of albumen gland length), ovate, scarcely extending posterior to albumen gland. Bursa of tall glandular cells having basal nucleii, lined with thick muscular coat. Bursal duct emerging from anterior tip of bursal copulatrix; distal section of duct broadened, with an internal division into two sections suggesting an enclosed seminal receptacle. (Study of thin sections could not confirm this possibility.) Duct to albumen gland (Dag) opening posteriorly from point where bursal duct and coiled oviduct join. Sperm tube (St) broad, thick, muscular, strongly ciliated; positioned ventro-laterally to capsule gland, joining capsule gland distally. Genital aperture (Ga) a short terminal slit.

Testis an unlobed mass, orange-colored, filling about 0.5 whorl posterior to stomach. Prostate gland narrow, bean-shaped; walls thick, lumen slit-like; pallial section prominent (about 60% of gland length). Posterior vas deferens opening to prostate gland just behind pallial wall; anterior vas deferens

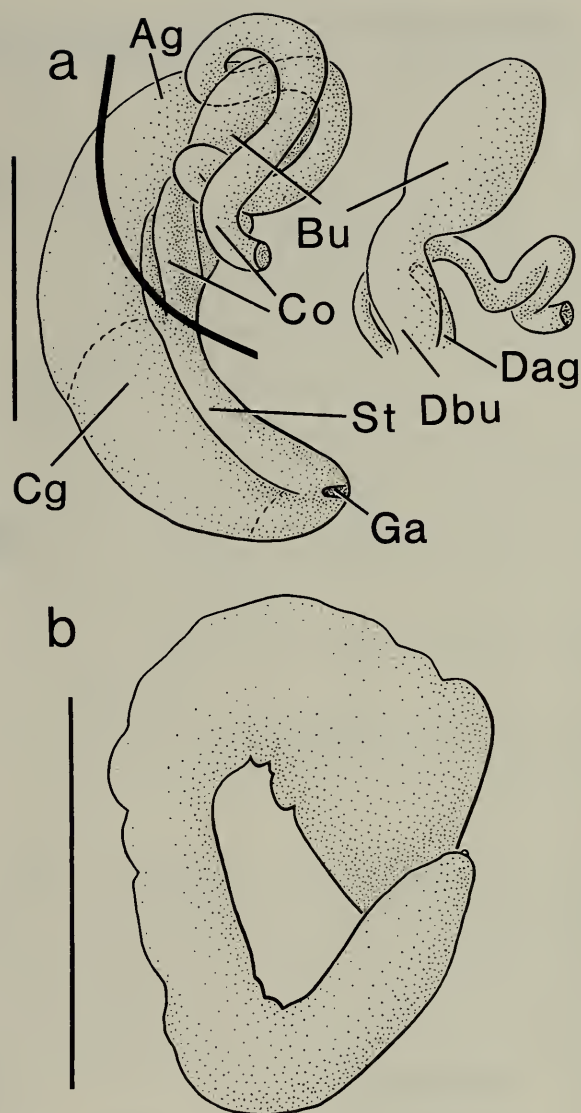


Fig. 4. Genitalia of *A. sketi*, USNM 860575. a. Left side of female glandular oviduct (bar = 0.5 mm). The thick curving line represents the posterior wall of pallial cavity. In the drawing to the right (slightly enlarged), the coiled oviduct has been cut and rotated to expose the bursa copulatrix and associated ducts. Abbreviations: Ag, albumen gland; Bu, bursa copulatrix; Cg, capsule gland; Co, coiled oviduct; Dag, duct to albumen gland; Dbu, bursal duct; Ga, genital aperture; St, sperm tube. b. Male penis, dorsal surface (bar = 0.25 mm).

opening subterminally. Pallial section of vas deferens with proximal coil. Penis (Fig. 4b) small, tightly coiled, positioned well behind cephalic tentacles slightly to right of center of "neck." Penis vermiform, unciliated, slightly broadened distally, with small folds on inner curvature near base. Distal tip of penis strongly tapered, vas deferens opening



Fig. 5. Map showing distribution of *A. sketi*. 1, Colombian localities near La Paz and San Gil, Santander Department; 2, Ecuador locality near Archidona, Napo Province.

through short terminal papilla. Proximal course of vas deferens not discernable.

Type locality.—Stream flowing into Cueva de los Indios, vicinity of La Paz, Santander Department, Colombia.

Distribution.—A trans-Andean species, occurring in cave streams of Rio Magdalena basin (draining to Caribbean), Colombia; and Rio Napo basin (Amazon basin), Ecuador.

Habitat.—*Andesipyrgus sketi* occurs in small Andean cave streams at elevations between 500–1990 m. Water temperatures among sites varied from 15–23°C. Some of the cave streams represent sinking rivers

whereas others probably originate from percolating waters. All of the streams contained some surface fauna, particularly insect larvae (Chironomidae, Elminthidae, etc.) and cyclopoid Copepoda, and most also were inhabited by more or less troglomorphic animals: variable catfish populations (*Trichomyterus* sp. in Colombia, *Astroblepus pholeter* Collette, in Ecuador) and probable troglobiont, amphibious crabs (*Neostrengeria sketi* Rodriguez, in Colombia) or amphipods (*Bogidiella gammariformis* Sket, in Ecuador). Snails were most common in the only cave lacking troglomorphic fauna (Cueva de los Indios) and in which *Tricho-*

myoterus was normally pigmented and shaped. For additional details, the reader is referred to Sket (1979, 1988).

Remarks.—Available material was unrelaxed, and details of shape of head and cephalic tentacles could not be discerned.

Populations varied in several shell features (width, angulation of aperture, whorl outline) and while available material does not permit meaningful analysis, further study may reveal that a species complex is involved.

Etymology.—Named in honor of Dr. Boris Sket, for his discovery of this species and for his encouragement of this collaborative study.

Acknowledgments

The authors thank Dr. Boris Sket for making collections of the Yugoslavian caving expeditions available for study and for providing useful comments on the manuscript. Scanning electron micrographs were prepared by Susann Braden of the Scanning Electron Microscopy Laboratory, National Museum of Natural History. Shells were drawn by Molly Ryan, Dept. of Invertebrate Zoology, National Museum of Natural His-

tory. Anatomical illustrations were inked by Susan Escher.

Literature Cited

- Bole, J., & F. Velkovrh. 1986. Mollusca from continental subterranean aquatic habitats. Pp. 177–208 in *Stygofauna mundi*, a faunistic, distributional, and ecological synthesis of the world faunas inhabiting subterranean waters (including the marine interstitial). E. J. Brill/Dr. W. Backhuys, Leiden, 740 pp.
- Hershler, R., & F. G. Thompson. 1992. A review of the genera of the aquatic gastropod subfamily cochliopinae (Prosobranchia: Hydrobiidae).—*Malacological Review Supplement* 5:1–140.
- Sket, B. 1979. Fauna in the Caverna de Jumandi.—*Nase Jame* 20:85–91.
- . 1985. *Bogidiella* (s.l.) *gammariformis* sp. n. (Amphipoda) from Ecuador.—*Bioloski Vestnik* 33:81–88.
- . 1988. Speleobiological investigations in the Colombian Andes 1984.—*Bioloski Vestnik* 36: 53–62.

(RH) Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A.; (FV) Department of Biology, Biotechnical Faculty, University of Ljubljana, Aškerčeva 12, 61001 Ljubljana, Slovenia.